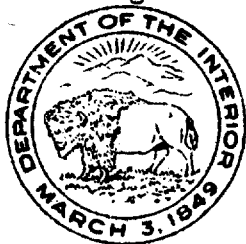


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## DEPARTMENT OF THE INTERIOR

### INFORMATION SERVICE

#### FISH AND WILDLIFE SERVICE

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#### NUMEROUS ELECTRONIC DEVICES UTILIZED IN FISHERY RESEARCH AND MANAGEMENT

Unwittingly and involuntarily the fish has "gone electric."

An electric fence has been used successfully by the Fish and Wildlife Service to keep the big Kodiak bear away from critical sections of salmon streams.

Electrical weirs protect fish by jolting the life out of sea lampreys on their way to spawning grounds to bring forth more lampreys to prey on more fish.

A "tattle-tale" electronic device, called a sonic tracker, is being attached to the back of salmon and for as much as 100 hours every twist and turn of the fish is flashed to a recording instrument on land or in a boat.

Fish count themselves when passing through another device created by the Fish and Wildlife Service and at times the fish take their own pictures.

Fish protection at powerplant intakes by use of electrical fish screens is being studied by the Fish and Wildlife Service, while in other places fish are being spotted for harvesting by any one of several fish finders which have been developed by electronic specialists.

An underwater telemeter which indicates the depth of nets has solved one of the problems of "mid-water" trawling while underwater television is telling the Fish and Wildlife Service more about fish in their regular habitat and more about what could be done to make fishing gear more efficient and effective.

Fish "shockers" are used to temporarily "knock out" fish in a stream to permit stream population counts.

Besides these, there are the fathometers used to measure ocean depths, radar and electrical beams and direction finders to guide ships and planes, and radio for communications.

All of these devices the Fish and Wildlife Service uses--some, like the fish counter, the Fish and Wildlife Service created; some, like the sonic tracker and underwater telemeter, electronic specialists created at the behest of the Fish and Wildlife Service; others, such as the fish finders and the underwater television, other sources created and developed and the Fish and Wildlife Service adapted for its use.

Three of these devices--the electric fish counter, the sonic tracker and the fish guiding apparatus--apply particularly to salmon studies but can be used on other species of fish as well. In fact, considerable interest has been shown in the fish counter and in the guiding device by many State fish and game departments. The sonic tracker is too new to elicit widespread comment yet.

The sonic tracker is to be used to study the passage of fish through fishways. The initial studies will be made at Bonneville Dam on the Columbia River where the Service has the facilities to observe fish behavior in several types of fishways. By being able to chart the reactions of salmon to various types of fishways, Service technicians hope to be able to determine the most effective fish ladder design.

The sonic tracker is a capsule about two and a half inches long and less than an inch in diameter which is fastened to the back of a salmon just to the rear of the dorsal fin. Studies show that the fish's reactions are normal about five seconds after the tracker is attached. It contains a 15-volt battery and other transmitting apparatus capable of sending signals for a period of time varying from 10 hours to 100 hours. The signals can be detected as far as 2,000 feet under ideal conditions. A fish carrying the capsule can be tracked and its position pinpointed for about 800 feet in clear still water and for about 100 feet in rough, turbulent streams. The receiver which automatically registers the movements can be placed on shore or installed in a boat. Sound waves may be varied so that movements of as many as ten fish can be traced at the same time.

The chief value of the electric fish counter at present is to test the effectiveness of the fishways as well as to register the number of salmon heading for the spawning grounds. The continuance of a salmon fishery depends to a great extent upon a sufficient number of adult fish reaching the spawning area. The practice of making visual counts at fish ladders and in streams has not been entirely satisfactory.

The counting device is fully automatic, not only counting the fish and indicating the size and direction of travel, but, through the medium of an underwater camera, it can identify the species of fish. The counter can also be adjusted merely to sound a signal when a fish goes past, thus alerting a watcher to his task. It is also possible to have the dial, which registers the fish, installed in an office or at some other point some distance from the stream. Indications are that this instrument, when fully developed, will be used in many parts of the Nation where fish runs are important and in many places where fish counts are needed.

Numerous techniques in screening young fish from water diversions have been tried with varying degrees of success. Since the power turbine and some of the big irrigation diversions offer a major threat to young fish, especially salmon on their way back to the sea, the Fish and Wildlife Service has done considerable research on mechanical and electrical methods of meeting the problem. Considerably more research is necessary along this line.

In small experimental streams these devices have been about 95 percent successful in guiding the fish into the desired places. Testing is now being done on

large streams. Two methods have been used, one based on the fact that fish are attracted to the positive pole. The other is based upon the principal of repulsion of fish by an electrical field.

The sea lamprey weir is an electrical barrier placed across a stream used by the lamprey for spawning. The weir is an apparatus of charged electrodes which sets up an electrical field which kills any sea lamprey attempting to pass through it. The weirs are installed in streams tributary to the Great Lakes in cooperation with the respective State fish and game departments. The sea lamprey which entered the upper Great Lakes about 20 years ago has destroyed the lake trout fishery of Lake Michigan and Lake Huron and has now appeared in Lake Superior. Its control is a major objective of the Service and allied agencies.

The underwater telemeter is a device which indicates the exact distance of the trawl or net below the surface of the water. Its use will aid considerably in increasing the efficiency of mid-water ocean commercial fishing, especially the exploratory work which will be necessary to determine the fishery values of the mid-water area. Comparatively little mid-water fishing has been done by American fishermen, who have concentrated on surface and bottom fishing.

The Fish and Wildlife Service has two underwater television units. One of these is at the Gear Research Laboratory at Coral Gables, Florida, and the other is at the Fishery Laboratory at Woods Hole, Massachusetts. At Coral Gables, the television has permitted close scrutiny of fishing gear in actual operation under water. It is expected that this research will result in many improvements in the efficiency of commercial fishing gear. At Woods Hole, biologists are more concerned with the effect of fishing gear upon fish which are too small for market. The sizes of fish which will escape through the meshes of trawls will be studied, as well as the manner of escape and behavior within the net, so as to determine methods of saving small fish from destruction. Biologists will also make various studies of the ocean bottom and the small marine animals which inhabit the bottom and serve as fish food.

In order that underwater television might be better utilized, the researchers at Coral Gables have developed an electrically controlled vehicle which permits the manipulation of the camera under water.

The use of the electric shocker in making fish population studies has been an accepted practice for years, but recent adaptations made by the State of New York under a Federal aid project now makes the shocker effective in soft water, thereby extending its usefulness into many areas.

The electric fence protects the spawning salmon from the bears. Generally speaking Kodiak bears can go any place they desire to go but a few brushes with the fence had a very salutatory effect upon the big fellows. This experiment has been in operation for about three years.

Thus electricity and electronics play a major role in the life of fish, protecting them from harm until such time as they become useful to man, at which time it swings against the fish and over to man, as attested by such devices as fish finders and the electric stove.

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